1. Determine if the following statement is True or False. If the statement is false, provide a counterexample or provide a justification.
   (a) I F and G are antiderivatives of f, then $F = G$.
   Solution: False. It can be $F = G + c$.
   (b) The antiderivative of $\sec^2(3x)$ is $\frac{1}{3}\tan(3x)$.
   Solution: True. Use change of variable or find derivative of $\frac{1}{3}\tan(3x)$.
   (c) The inde
   nite integral of a function f is the collection of all antiderivatives of f.
   Solution: True.
   (d) We know how to find the antiderivative of e^{x^2}, and it is e^{x^2}.
   Solution: False. $\frac{d}{dx}e^{x^2} = 2xe^{x^2}$.
   (e) F and G are antiderivatives of f and g, then antiderivative of FG is fg.
   Solution: False. Because of the product rule.

2. Evaluate the following inde
   nite integrals.
   (a) $\int(\sqrt[3]{x} - \frac{1}{x})^3 dx$.
   Solution. $\int(\sqrt[3]{x} - \frac{1}{x})^3 dx = \int(x - \frac{3}{\sqrt[3]{x^2}} + \frac{3}{\sqrt[3]{x^5}} - \frac{1}{x^3})dx = \frac{x^2}{2} - 9x^{1/3} - \frac{9x^{-2/3}}{2} + \frac{x^{-2}}{2}$.
   (b) $\int(3^{-x} + e^{-5x})dx$.
   Solution. $\int(3^{-x} + e^{-5x})dx = -\frac{3^{-x}}{\log(3)} - \frac{e^{-5x}}{5}$.
   (c) $\int \frac{e^{\sqrt{2}} + x^{\sqrt{2}}}{\sqrt{x}}$.
   Solution. $\int \frac{e^{\sqrt{2}} + x^{\sqrt{2}}}{\sqrt{x}}dx = \frac{-e^{\sqrt{2}}\sqrt{x}}{2} + \frac{x^{\sqrt{2}+\frac{1}{2}}}{\sqrt{2}+\frac{1}{2}}$.

3. (Optional): Evaluate $\int \sqrt{\tan(x)}dx$.
   Solution: Let $\tan^2(u) = \tan(x)$. Then $2(\tan^2(u) + 1)\tan(u)du = (\tan^2(x) + 1)dx$. So
   $$\int \tan(u)\frac{2(\tan^2(u) + 1)\tan(u)du}{\tan^4(u) + 1}$$
   Then use partial fraction.